PRODUCT CATALOGUE

» Engine & Gen-set Controls

» Marine Bridge Instrumentation

» Switchboard Instrumentation

» Renewable Energy Controls

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Table of content

Engine & Gen-set Controls				**6**
Engine starters, mains failure units				7
Table of Products		4921240159	B	7
Key Starter	KSE72-1N	4921240029	C	8
Stop Relay	SR-1	4921240041	C	12
Multi-line 2, Engines and Gen-set Controls				14
Table of Products		4921240209	S	14
Synchronising equipment Electr. Pot. Meters				23
Table of Products		4921240160	K	23
Uni-line relays, synchronisers, load sharing units				26
Table of Products		4921240130	N	26
Marine Bridge Instrumentation				**32**
Illuminated indicators, Anemometers				33
Table of Products		4921240143	U	33
Renewable Energy Controls				**36**
Renewable Energy Controls				37
Table of Products		4921240338	B	37
Switchboard Instrumentation				**40**
Battery chargers				41
Table of Products		4921240286	C	41
Current transformers				43
Table of Products		4921240331	A	43
Energy Meters				44
Table of Products		4921240252	A	44
Panel meters, Accessories				45
Table of Products		4921240140	ZI	45
Transducers				51
Table of Products		4921240158	R	51
Replacements				**54**
Replacements: Alarm And Monitoring System	845	4921230013	C	55

Engine & Gen-set Controls

	Key Starters, KSE72-1N	Stop Relays, SR-1	
Main functions:	Manual start/stop and automatic super vision / emergency shutdown of smaller engines. Suitable for both 12V and 24V starting batteries. For diesel engines with “”stop coil”” a seperate stop relay type SR-1 is applied. The *Key switch* can be set in 3 positions: “START”, “RUN”, “STOP” *4 inputs:* Oil pressure, temperature and A & B (customisable alarm inputs) *Protection:* IP41 *Aux. voltage:* 12 and 24V DC	Stop relay designed for internal com bustion engines fitted with a stop so lenoid. The relay is for use with the key starter KSE72-1N and is designed for 35 mm DIN rail mounting. *Activation time:* appr. 20 s *Output:* relay output (change-over switch) for connection of stop solenoid) *Aux. voltage:* 9…30V DC *Protection:* IP53	

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DEIF A/S

Key starter

Type KSE72-1N

4921240029C

- *2 standard alarm inputs*
- *2 customer selectable alarm inputs*
- *Charge circuit indicator*
- *Inhibit of alarms during start sequence*
- *Automatic emergency shutdown of engine*

CE

Application
KSE72-1N is a compact, generally applicable unit for manual start/stop and automatic supervision/emergency shutdown of smaller diesel or petrol engines. For diesel engines with "stop coil" a separate stop relay type SR-1 (see specific data sheet) is applied. The KSE72-1N is CE classified for residential, commercial and light industry plus industrial environment.

The KSE72-1N is without adjustment suitable for both 12V and 24V starting batteries.
A maximum of 4 alarm devices can be connected to the key starter. In case of failure, the LED indicator for the relevant alarm input is lit, the engine is stopped and a signal is transmitted to an external alarm device.

The alarms remain inhibited for 10 s. after start of the engine, to allow e.g. normal oil pressure to be established during this period of time. A pre-exciting current is fed to the charging generator and an LED is lit in case of insufficient charging voltage.

Mechanical construction
KSE72-1N is housed in a robust plastic housing for flush mounting. The key switch is mounted in a solid aluminium plate. The front plate and the 5 red LEDs are covered by a hard-wearing polycarbonate film provided with text on the inside. The rear consists of an epoxy plate with spade plugs (6.3 x 0.8 mm) for electrical connections, provided with text (terminal No./designation).

Key switch
The key switch can be set in 3 positions:

”START”	Starts the engine. When the engine starts the key is released which then returns to the "RUN" position (spring loaded).
”RUN”	Normal position when the engine is running.
”STOP”	Manually stops the engine. Reset of alarm after automatic shutdown of the engine upon detection of a failure. The key can only be removed when set to this position.

Inputs
KSE72-1N is provided with 4 inputs for connection of the following alarm contacts:

”OIL SW.”	Oil pressure sensor (too low oil pressure).
”TEMP. SW.”	Termostat (too high engine temperature).
”A and ”B”	Other alarm contacts, e.g. overspeed, low coolant level, etc. Descriptive texts can be filled in using black marking pen.

Activation of alarm inputs
The alarm inputs are activated at either N/O or N/C contact function - determined by the position of the jumper marked "J1" on the rear of the unit. The setting is COMMON to all 4 inputs. See detailed instruction (in English/German) on the side panel of the unit. NOTE: "J1" is mounted (CLOSED) on delivery.

"J1" closed:	An alarm is registered when the first external alarm contact OPENS (N/C). NB: unused inputs should be short-circuited !
"J1" open:	An alarm is registered when the first external alarm contact CLOSES (N/O). NB: unused inputs should be left open!

Outputs
The unit is provided with 4 outputs for connection of the following external components:

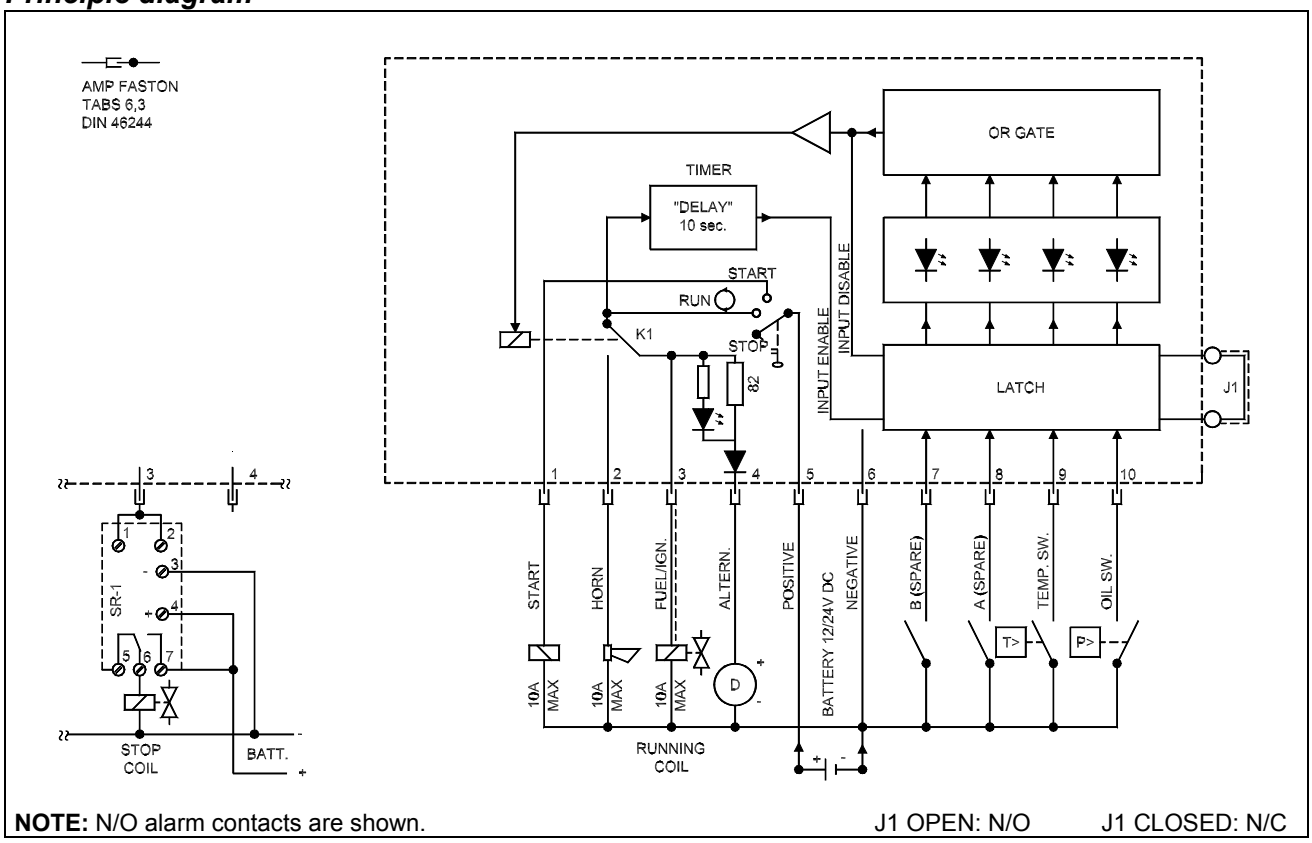
"START"	Relay for starting motor (max. 10A DC).
"FUEL/IGN."	Fuel solenoid or ignition coil (max. 10A DC). For stop coils use external stop relay type SR-1 (See specific data sheet).
"ALTERNATOR"	Charging generator (pre-exciting current: 120mA through internal resistor).
"HORN"	For connection of alarm device (max. 10A DC).

Alarm inhibit during start sequence
When the key is set to the "START" or "RUN" position, all alarm inputs remain inhibited for the next 10 secs. Unwanted stop of the engine, e.g. due to low oil pressure during the start sequence, is thus prevented.

Emergency shutdown of the engine
If an alarm condition is detected after the above period of time, the LED indicator for the first received alarm signal is lit, the engine is stopped and the alarm horn is activated.

The horn may then be reset by turning the key to the "STOP" position.

Principle diagram



NOTE: N/O alarm contacts are shown. J1 OPEN: N/O J1 CLOSED: N/C

Function

Pre-glowing of the diesel engine (if required) must be carried out before the key is turned from the "STOP" position!

To start the engine, turn the key to the "START" position. This results in:

1) Activation of the starting motor through an external starter relay.
2) Activation of the fuel starting coil and/or the ignition coil.
3) Connection of a pre-exciting current (ca. 120mA) for the charging generator.
4) Inhibit of all alarm channels.
5) Start of the "DELAY" timer.
   If the engine starts, the key is released. It returns to the "RUN" position which results in:
6) Disconnection of the starting motor.
7) Switch off of the LED indicator for the charge circuit, if the generator works normally.
8) Release of all alarm channels after the time delay ("DELAY").

In case of failure in one of the supervised functions, the following steps are carried out:

1) Illumination of the relevant LED indicator.
2) Inhibit of remaining alarm channels (i.e. indication of the first alarm only).
3) Activation of the internal relay ("K1"). The relay contact changes position.
4) Activation of the alarm horn (or the like).
5) Disconnection of the fuel starting coil and/or the ignition coil.
6) Disconnection of the pre-exciting current for the charging generator.
7) Shutdown of the engine.

The alarm is reset by turning the key to the "STOP" position.

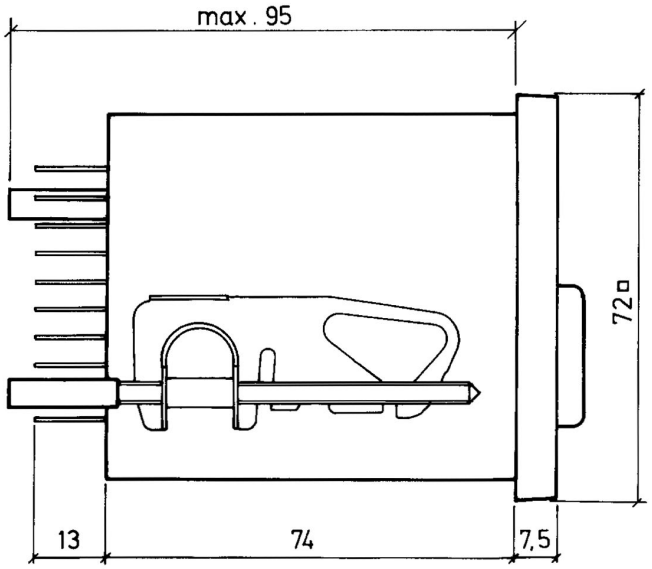
To stop the engine manually, turn the key to the "STOP" position, i.e. steps 5-8 are carried out.

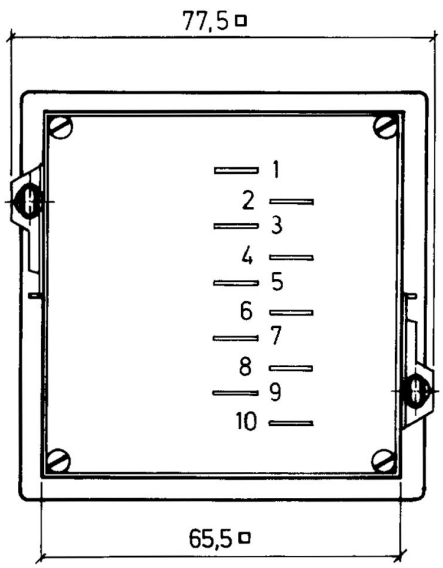
Technical specifications

Auxiliary voltage:	Suitable for both 12V DC and 24V DC. Protected against polarization errors. Functional range: 0..30V DC during start sequence. 9..30V DC after the engine has been started.
Consumption:	Max. 20mA DC (no alarm). Max. 120mA DC (at alarm).
Alarm contacts:	Open contact: 6V DC. Closed contact: 12mA DC.
Outputs:	"START", "FUEL/IGN." and "HORN": Max. 10A DC. "ALTERNATOR": 120mA for pre-excitation of charger circuit. Short-circuit protection, max. 420mA.
Alarm inhibit:	10 s Tolerance: ±2 s.
Key system:	Standard: All units identically coded. 2 keys supplied with each unit. Individually coded key/lock available on request.
Ambient temperature:	-10...55°C (nominal), -25..+70 C (operating), -40..+70 C (storage).
Climate:	Class HSE, to DIN 40040.
Vibration:	3..30Hz: 100 mm/s, 30..100Hz: 1.9 g, to GL + LR: Test 1 and DNV: Class B.
Shock:	15 g, tested 6 times in 3 directions, to IEC 68-2-27, Test: Ea.
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4), IEC 255-22-1 (class 3).
Plastic materials:	Self-extinguishing, to UL94 (V0).
Connections:	Standard spade plug, 6.3 x 0.8 mm.
Protection:	IP41, to IEC 529 and EN 60529.

Dimensions

All dimensions in mm





KSE-1N Weight: approx. 0.350 kg Panel cut-out: 68 x 68 mm +0.7 to DIN 43700

Order specifications

KSE72-1N
Individually coded keys/lock and front panel to customer design – on request

Due to our continous development we reserve the right to supply equipment which may vary from the described.

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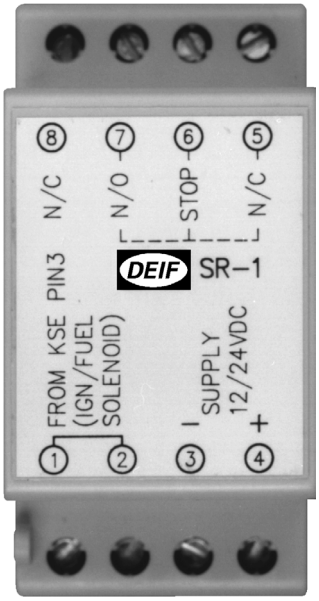
DEIF A/S

Stop relay

Type SR-1

4921240041C



- *For internal combustion engines*
- *For use with key starter type KSE72*
- *Activation time: approx. 20 s*
- *For DIN rail mounting*

Application

The stop relay type SR-1 is designed for internal combustion engines fitted with a stop solenoid.

The relay is for use with the key starter **KSE72-1N** and is CE classified for residential, commercial and light industry plus industrial environment.

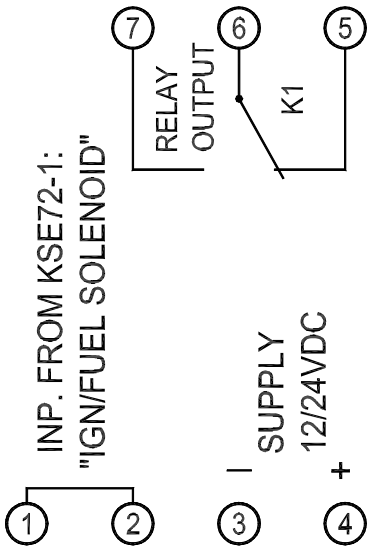
The SR-1 is provided with a built-in relay, which is activated for approx. 20 s. when the unit receives a signal from the key starter.

The SR-1 is housed in a plastic housing complete with screw terminals for connection of stop solenoid, auxiliary voltage and key starter.

Technical specifications

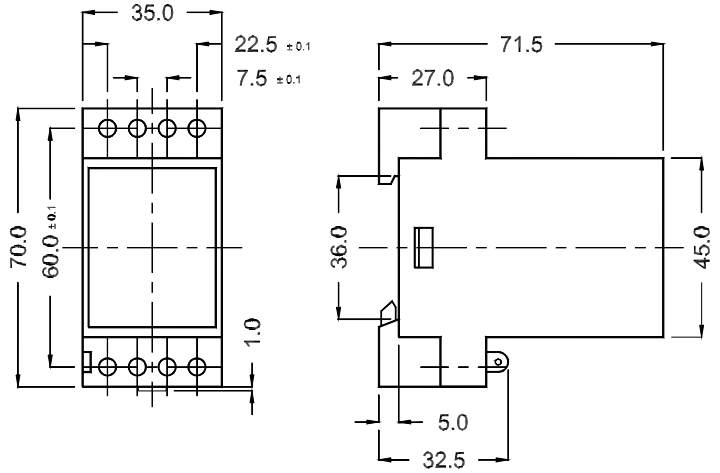
Input:	Connection to KSE72-1N (terminal marked "IGN./FUEL").
Output:	Relay output (change-over switch) for connection of stop solenoid. Max. load: 30V/10A DC.
Auxiliary voltage:	9...30V DC (protected against incorrect polarity).
Consumption:	Activated: max. 120mA. De-activated: max. 20mA.
Temperature:	-10...55°C (nominal), -25...65°C (operating). -25...65°C (storage).
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-22-1 (class 3).
Climate:	Class HSE, to DIN 40040.
Vibration:	To DNV: Class B.
Materials:	Polystyrene HSF 13.
Connections:	Screw terminal, max. 1 x 4 mm².
Protection:	Case: IP53, terminals: IP20, to IEC 529 and EN 60529.
Mounting:	35 mm DIN rail.

Connections



Dimensions

All dimensions in mm



Weight: approx. 0.010 kg

SR-1

Order specifications

Type

Due to our continous development we reserve the right to supply equipment which may vary from the described.

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	Multi Differential Relay, MDR-2	Generator protection Unit, GPU-2	Paralleling and Protection Unit, PPU-2
Main function	Multi Differential Relay for protection against short circuits and currents	Engine and generator control and protection unit for single operation	Engine and generator control and protection unit for single and parallel operation
Auxiliary voltage	8-36V DC	8-36V DC	8-36V DC
Measuring voltage	–	100-690V	100-690V
Current transformer	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A
Frequency	30-70Hz	30-70Hz	30-70Hz
Remote mountable display	●	●	●
Approved by classification societies	●	●	●
BASE / DIN rail mounting	●	●	●
Start / stop relay output to next generator	–	○	●
Synchronising	–	○	●
Differential relay	●	–	–
Load sharing	–	–	●
Display / PC cables	○	○	○
IP 54 protection of display	○	○	○
Loss of mains protection package	–	○	○
df / dt	–	○	○
Vector jump	–	○	○
Busbar and generator protection package	–	○	○
Generator add-on protection package	–	○	○
Zero + negative sequence	–	○	○
Voltage control	–	○	○
Analogue transducer output	–	○	○
Engine communication	–	○	○
Serial communication	–	○	○
Configurable ext. cards	–	○	○
Engine protection	–	○	○
Var / cos phi control	–	–	○
Analogue controller output	–	–	○
Combination outputs	–	–	○

● = standard ○ = optional – = not possible

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	Generator protection Unit, GPU-3	Paralleling and Protection Unit, PPU-3	
Main function	Engine and generator control and protection unit for single operation	Engine and generator control and protection unit for single and parallel operation	
Auxiliary voltage	8-36V DC	8-36V DC	
Measuring voltage	100-690V	100-690V	
Current transformer	-/1A or -/5A	-/1A or -/5A	
Frequency	30-70Hz	30-70Hz	
Remote mountable display	●	●	
Approved by classification societies	●	●	
BASE / DIN rail mounting	●	●	
Start / stop relay output to next generator	●	●	
Busbar and generator protection package	●	●	
M-logic (micro PLC)	●	●	
Synchronising	○	●	
Load sharing	–	●	
IP 54 protection of display	○	○	
Loss of mains protection package	○	○	
Additional displays (DU-2)	○	○	
Voltage control	○	○	
Generator add-on protection package	○	○	
Analogue transducer output	○	○	
Engine communication	○	○	
Serial communication	○	○	
Configurable ext. cards	○	○	
Engine protection	○	○	
Analogue controller output	○	○	
Combination outputs	○	○	
Additional Operator Panel (AOP-1/AOP-2)	○	○	
TCP/IP modbus	○	○	
Class 0.5 measurement	○	○	
Var / cos phi control	–	○	

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	PPU Power Management Unit, PPM-2	Protection Power Management, PPM-3	
Main function	Engine and generator control, protection and power management unit for parallel operation	Engine and generator control, protection and power management unit for parallel operation	
Auxiliary voltage	8-36V DC	8-36V DC	
Measuring voltage	100-690V	100-690V	
Current transformer	-/1A or -/5A	-/1A or -/5A	
Frequency	30-70Hz	30-70Hz	
Busbar and generator protection package	●	●	
Generator add-on protection package	●	●	
Power management	●	●	
Synchronising	●	●	
Load sharing	●	●	
Remote mountable display	●	●	
Engine protection	●	●	
Approved by classification societies	●	●	
BASE mounting	●	●	
Additional displays	○	○	
Additional Operator Panel (AOP-1)	–	○	
Additional Operator Panel (AOP-2)	●	○	
Available without display	–	○	
Voltage control	○	○	
Var / cos phi control	○	○	
Analogue controller output	○	○	
Analogue transducer output	○	○	
Combination outputs	○	○	
Engine communication	–	○	
Serial communication	○	○	
Display / PC cables	○	○	
IP 54 protection of display	○	○	
Configurable ext. cards	○	○	
TCP/IP	○	○	
Class 0.5 measurement	–	○	

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	Engine Controller, Marine EC-1M	Generator controller, Marine GC-1M	
Main function	Engine control and protection	Engine and generator control and protection	
Auxiliary voltage	8-36V DC	8-36V DC	
Measuring voltage	50-480V	50-480V	
Current transformer	–	-/1A or -/5A	
Frequency	30-70Hz	30-70Hz	
Engine start / stop relay output	●	●	
Engine protection	●	●	
Approved by classification societies	●	●	
Generator protection package	○	●	
Engine communication	○	○	
Display / PC cables	○	○	
IP 54 protection of display	○	○	
Serial communication	○	–	
AMF logic	–	○	

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	Gen-set Controller, GC-1F	Automatic Gen-set Controller, AGC-3	
Main function	Engine and generator control and protection unit for single operation	Island mode, AMF, fixed power, peak shaving, mains power export, load take over	
Auxiliary voltage	6-36V DC	8-36V DC	
Measuring voltage	50-480V	100-690V	
Current transformer	-/1A or -/5A	-/1A or -/5A	
Frequency	30-70Hz	30-70Hz	
Remote mountable display	–	●	
Engine protection	●	●	
AMF logic	○	●	
Busbar and generator protection package	● (Generator protection only)	○	
Start/stop relay output to next generator	–	●	
Synchronising	–	●	
BASE / DIN rail mounting	–	●	
IP protection of display	○ (IP 65)	○ (IP 54)	
Engine communication	○	○	
Serial communication	○	○	
Additional Operator Panel/Additional display	○	○	
Display / PC cables	○	○	
Loss of mains protection package	–	○	
df / dt	–	○	
Vector jump	–	○	
Positive Sequence	–	○	
Directional overcurrent	–	○	
Generator add-on protection package	–	○	
Zero + negative sequence	–	○	
Voltage control	–	○	
Var / cos phi control	–	○	
Analogue controller output	–	○	
Analogue transducer output	–	○	
Combination outputs	–	○	
Power management	–	○	
Load sharing	–	○	
Configurable ext. cards	–	○	
TCP/IP	–	○	
Alarm log printer	–	○	
Class 0,5 measurement	–	○	
Approvals	UL/cUL	UL/cUL	

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	AGC 212	AGC 213	AGC 223	AGC 232	AGC 242	AGC 244	AGC 245	AGC 246
Main function:	Island mode	Island mode, AMF	Island mode, AMF, fixed power, peak shaving, load take over	Island mode, load sharing	Island mode, AMF, fixed power, peak shaving, load take over, load sharing	Island mode, AMF, fixed power, peak shaving, load take over, load sharing	Island mode, AMF, fixed power, peak shaving, load take over, load sharing	Island mode, AMF, fixed power, peak shaving, load take over, load sharing
Auxiliary voltage	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC
Measuring Voltage:	50-690V AC	50-690V AC	50-690V AC	50-690V AC	50-690V AC	50-690V AC	50-690V AC	50-690V AC
Current transformer:	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A
Frequency:	30-70Hz	30-70Hz	30-70Hz	30-70Hz	30-70Hz	30-70Hz	30-70Hz	30-70Hz
Engine protection	●	●	●	●	●	●	●	●
Busbar and generator protection package	●	●	●	●	●	●	●	●
Synchronising	●	●	●	●	●	●	●	●
Engine communication	●	●	●	●	●	●	●	●
Voltage control	●	●	●	●	●	●	●	●
Var / cos phi control	●	●	●	●	●	●	●	●
User-programmable logic (M-Logic)	●	●	●	●	●	●	●	●
Configurable inputs / outputs	●	●	●	●	●	●	●	●
High speed USB connection	●	●	●	●	●	●	●	●
AMF logic	–	●	●	–	●	●	●	●
Multi master Power Management	–	–	–	–	●	●	●	●
Redundant CANbus for power management	–	–	–	–	●	●	●	●
Start/stop relay output to next generator	–	–	–	●	●	–	–	–
Load sharing	–	–	–	●	●	–	–	–
IP65 protection	○	○	○	○	○	○	○	○
RS485	○	○	○	○	○	○	○	○
Additional Operator Panel	○	○	○	○	○	○	○	○
Loss of mains protection package	○	○	○	○	○	○	○	○
df / dt	○	○	○	○	○	○	○	○
Vector jump	○	○	○	○	○	○	○	○
Positive sequence	○	○	○	○	○	○	○	○
Directional overcurrent	○	○	○	○	○	○	○	○
Generator add-on protection package	○	○	○	○	○	○	○	○
Zero + negative sequence	○	○	○	○	○	○	○	○
Analogue controller output	○	○	○	○	○	○	○	○
TCP Modbus	○	○	○	○	○	○	○	○
Remote mountable display	–	–	–	–	–	–	–	–
Approvals	CE, UL/cUL pending	CE, UL/cUL pending	CE, UL/cUL pending	CE, UL/cUL pending	CE, UL/cUL pending	CE, UL/cUL pending	CE, UL/cUL pending	CE, UL/cUL pending

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	Generator Paralleling Controller, GPC-3		
Main function	Engine and gen-set control and protection for single and parallel operation		
Auxiliary voltage	8-36V DC		
Measuring voltage	100-690V		
Current transformer	-/1A or -/5A		
Frequency	30-70 Hz		
Remote mountable display	●		
BASE / DIN rail mounting	●		
Start/stop relay output to next generator	●		
Busbar and generator protection package	●		
M-Logic (Micro PLC)	●		
Synchronising	●		
Load sharing	●		
IP54 protection of display	○		
df/dt	○		
Vector jump	○		
Positive sequence	○		
Directional overcurrent	○		
Zero + negative sequence	○		
Additional display	○		
Voltage control/Var/Pf	○		
Analogue transducer	○		
Engine communication	○		
Serial communication	○		
Configurable ext. cards	○		
Engine protection	○		
Analogue controller output	○		
Additional operator panel	○		
TCP/IP	○		
Class 0.5 measurement	○		
Approvals	UL/cUL		

● = standard ○ = optional – = not possible

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	Basic Gen-set Controller, BGC-2	Generator Paralleling Controller, GPC-2	Automatic Gen-set Controller. AGC-2
Main function	Island mode, AMF, fixed power, peak shaving, load take over, load sharing	Engine and generator control and protection unit for single and parallel operation	Island mode, AMF, fixed power, peak shaving, mains power export, load take over
Auxiliary voltage	8-36V DC	8-36V DC	8-36V DC
Measuring voltage	100/110V + 380/480V	100-690V	100-690V
Current transformer	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A
Frequency	30-70Hz	30-70Hz	30-70Hz
Start/stop relay output to next generator	○	●	●
Synchronising	○	●	●
AMF logic	●	–	●
Remote mountable display	–	●	●
BASE / DIN rail mounting	–	●	●
Load sharing	○	●	○
Engine protection	●	○	○
Loss of mains protection package	○	○	○
df / dt	○	○	○
Vector jump	○	○	○
Busbar and generator protection package	○	○	○
Generator add-on protection package	○	○	○
Voltage control	○	○	○
Var / cos phi control	○	○	○
Analogue controller output	○	○	○
Analogue transducer output	○	○	○
Engine communication	○	○	○
Serial communication	○	○	○
Display / PC cables	○	○	○
IP 54 protection of display	○	○	○
Configurable ext. cards	○	○	○
Zero + negative sequence	–	○	○
Combination outputs	–	○	○
Additional Operator Panel	–	–	○
Positive Sequence	–	–	○
Power management	–	–	○

● = standard ○ = optional – = not possible

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	Engine Controller, EC-1	Generator Controller, GC-1	
Main function	Engine control and protection	Engine and generator control and protection	
Auxiliary voltage	4-36V	4-36V	
Measuring voltage	50-480V	50-480V	
Current transformer	–	-/1A or -/5A	
Frequency	30-70Hz	30-70Hz	
Engine start / stop relay output	●	●	
Engine protection	●	●	
Generator protection package	○	●	
Engine communication	○	○	
Display / PC cables	○	○	
IP 54 protection of display	○	○	
AMF logic	–	○	
Serial communication	○	–	

● = standard ○ = optional – = not possible

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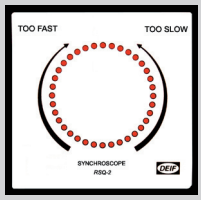
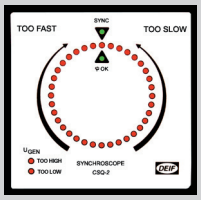
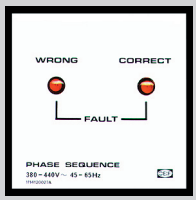
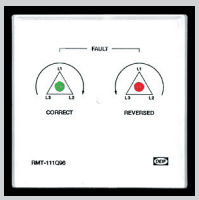
	LED Synchroscopes, RSQ-3	Check Synchronising Relays, CSQ-3	
			
Main function:	Electronic synchroscope.	Combined check synchronising relay and synchroscope.	
Size (mm):	Q96	Q96	
Customised scale:	√	√	
Exchangeable scale:	-	-	
Protection IP52:	√	√	
Protection IP54 on request:	-	-	
Mains voltage:	100…127V AC (115V AC) 220…240V AC (230V AC) 380…415V AC (400V AC) 440...480V AC (450V AC)	100…127V AC (115V AC) 220…240V AC (230V AC) 380…415V AC (400V AC) 440...480V AC (450V AC)	
Frequency range:	40…70Hz	40…70Hz	
Contact rating:	-	250V-8A-2000VA (AC) 24V-8A-200W (DC)	
Approved by classification societies:	-	√	

	Phase Sequence Meters, PHQ	Phase Sequence Relays, RMT-111Q96	Lamp Synchroscopes, LSQ
			
Main function:	PHQ is a solid state phase sequence meter provided with 2 glow discharge lamps for indication of correct or in-correct connection of the phases and phase breakage.	RMT-111Q96 is a phase sequence relay with contacts and is applied for check of the phase sequence. Provided with long-life LED indicators.	Lamp synchroscope for indication of phase sequence accordance between generator and bus-bar prior to connection.
Size (mm):	Q96	Q96 (flush mounting)	Q96, Q144
Customisable scale:	√	√	√
Exchangeable scale:	-	-	-
Protection IP52:	√	√	√
Protection IP54 on request:	√	√	-
Mains voltage:	380...440V AC	230V AC ±20% Max. 3W 400V AC ±20% Max. 3W	100-110 / 220-230-240 / 380-415-440V AC ±20%
Frequency range:	45…65Hz	47…63Hz	40…70Hz
Relay output:	-	Changeover switch	-
Approved by classification societies:	-	√	-

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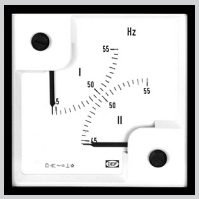
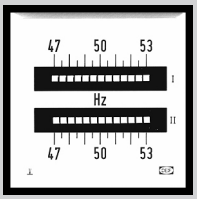
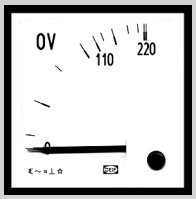
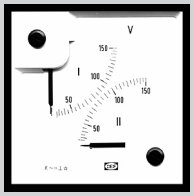
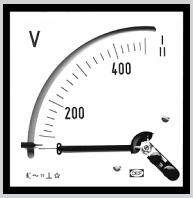
	Double Frequency Meters, 2FQ	Double Frequency Meters, 2FTQ	Zero Voltage Meters, NEQ
			
Main function	Double pointer frequency meter, based on 2 moving coil instruments mounted diagonally. Accurate and linear read-out.	Double reed frequency meter with 2 rows of reeds.	Zero voltage meter for indication of voltage match between generator and bus-bar prior to connection.
Size (mm):	Q96	Q96, Q144	Q72, Q96
Pointer deflection:	90°	-	90°
Customised scale:	√	√	√
Exchangeable scale:	-		-
Protection IP52:	√	√	√
Protection IP54 on request:	-	√	-
Accuracy class:	0.5	0.5	1.5 and 3.0
Scale / measuring range:	45…55 / 55…65 / 45…65Hz Others on request	47…53 / 45…55 / 57…63 / 55…65Hz	110-220 / 220-440 / 400-800V AC (1.5…4VA)
Measuring voltage:	85...265V AC or 340...506V AC	100-110-220-230-240-380-400-415-440V AC ±15%	-

	Double Voltmeters, 2EVQ	Double Voltmeters, 2EQ	
			
Main function:	Double voltmeter based on 2 moving iron systems mounted diagonally.	Double voltmeter based on 2 inde-pendent moving iron systems with joint scale.	
Size (mm):	Q96	Q96	
Pointer deflection:	90°	90°	
Customised scale:	√	√	
Exchangeable scale:	-	-	
Protection IP52:	√	√	
Protection IP54 on request:	-	-	
Accuracy class:	1.5	1.5	
Scale / measuring range:	0…150 / 300 / 600V	0…150 / 250 / 500V	
Measuring frequency:	50 or 60Hz	50 or 60Hz	

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	Electronic Potentiometers, EPQ-96		
Main function:	Maintenance-free electronic potentiometer with manual / auto switch for control of AVR's and speed governors.		
Size (mm):	Q96		
Output (2 ranges):	0...±5V or 0…±10V (at output signals without load)		
Ripple:	Max. 5mV RMS		
Resolution:	5m DC (12-bit D/A-converter)		
Integrating time (2 ranges):	2.5…25 s or 12.5…125 s		
Response time:	< 0.1 s		
Reproduceability:	±2%		
Accuracy of adjustment:	±20%		
Supply voltage:	24V DC ±25%		
Protection:	IP52		

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	ANSI code 27, 59	ANSI code 59	ANSI code 27
	RMV-112D	**RMV-122D**	**RMV-132D**
Main functions:	**Under- /overvoltage protection:** - timer controlled tripping - adjustable hysteresis	**Overvoltage protection (2 levels):** - timer controlled tripping - adjustable hysteresis	**Undervoltage protection (2 levels):** - timer controlled tripping - adjustable hysteresis
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	√
Meas. voltage (U_n): 57.7...690V AC	√	√	√
Meas. current (I_n): 0.4...5.0A	-	-	-
Frequency range: 40..45...65..70Hz	√	√	√
Outputs:	1 minimum and 1 maximum relay output Settings: ±20% of U nom Delay: 0.5...10 s Hysteresis: 1...10% of U nom	2 maximum relay outputs Settings: 0...+20% of U nom Delay: 0.5...10 s Hysteresis: 1...10% of U nom	2 minimum relay outputs Settings: 0...-20% of U nom Delay: 0.5...10 s Hysteresis: 1...10% of U nom
Measuring system:	Δ, 3 phase 3 wire, Y, 3 phase 4 wire	Δ, 3 phase 3 wire, Y, 3 phase 4 wire	Δ, 3 phase 3 wire, Y, 3 phase 4 wire
Approved by classification societies:	√	√	√

	ANSI code 27, 59		
	RMV-142D		
Main functions:	**Under- /overvoltage protection:** - timer controlled tripping - adjustable hysteresis		
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√		
Meas. voltage (U_n): 57.7...690V AC	√		
Meas. current (I_n): 0.4...5.0A	-		
Frequency range: 40..45...65..70Hz	√		
Outputs:	1 minimum and 1 maximum relay output Settings: ±20% of U nom Delay: 0.5...10 s Hysteresis: 1...10% of U nom		
Measuring system:	2 phase, single phase		
Approved by classification societies:	√		

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	ANSI code 50, 51	ANSI code 50, 51	ANSI code 50, 51
	RMC-111D	**RMC-121D**	**RMC-122D**
Main functions:	**Short circuit relay:** - short circuit protection - timer controlled tripping	**Short circuit current relay:** - short circuit protection - timer controlled tripping	**Overcurrent and short circuit relay:** - short circuit/overcurrent protection - timer controlled tripping
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	√
Meas. voltage (U_n): 57.7...690V AC	-	-	-
Meas. current (I_n): 0.4...5.0A	√	√	√
Frequency range: 40..45...65..70Hz	√	√	√
Outputs:	1 maximum relay output Setting: 100...400% of I nom Delay: 0.1...1/5/10 s	1 maximum relay output with 2 sets of contacts Setting: 100...400% of I nom Delay: 0.1...1/5/10 s	2 maximum relay outputs Settings: 50...150% of I nom, 100...400% of I nom Delay: 0.1...1/5/10 s, 0.5…20/60/120 s
Measuring system:	3 phase	3 phase	3 phase
Approved by classification societies:	√	√	√

	ANSI code 87	ANSI code 50, 51	ANSI code 50N, 51N
	RMC-131D	**RMC-132D**	**RMC-142D**
Main functions:	**Differential current relay:** - protection against short circuits and leakage current in the generator winding - timer controlled tripping	**Dual overcurrent relay:** - overcurrent protection - timer controlled tripping	**Stator earth fault relay:** - earth fault protection at 2 levels - built-in filter for 3rd harmonic - timer controlled tripping
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	√
Meas. voltage (U_n): 57.7...690V AC	-	-	-
Meas. current (I_n): 0.4...5.0A	√	√	√
Frequency range: 40..45...65..70Hz	√	√	√
Outputs:	1 maximum relay output with 2 sets of contacts Settings: 4...40% of I nom Delay: 0.1...1/5/10 s	2 maximum relay outputs Settings: 50…150% of I nom Delay: 0.5…20/60/120 s	2 maximum relay outputs Settings: 2…20%, 10…110% of I nom Delay: 0.5…20/60/120 s
Measuring system:	3 phase	3 phase	Single phase
Approved by classification societies:	√	√	√

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	ANSI code 32	ANSI code 32	ANSI code 32
	RMP-111D	**RMP-112D**	**RMP-121D**
Main functions:	**Overload relay:** - overload protection of generator and prime mover - real power relay - timer controlled tripping	**Overload/reverse power relay:** - combined overload and reverse power protection - protection against ”motoring” - timer controlled tripping	**Reverse power relay:** - ”motoring” protection of generator and prime mover - timer controlled tripping
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	√
Meas. voltage (U_n): 57.7...690V AC	√	√	√
Meas. current (I_n): 0.4...5.0A	√	√	√
Frequency range: 40..45...65..70Hz	√	√	√
Outputs:	1 maximum relay output Settings: 25...125% of P nom Delay: 0.4...20 s	1 max. + 1 min. relay output Settings: 25...125%,-0...-25% of P nom Delay: 0.4...20 s	1 minimum relay output Settings:-0...-25% of P nom Delay: 0.4...20 s
Measuring system:	2W3, 3 phase 3 wire unbal. load 3W3, 3 phase 3 wire unbal. load 3W4, 3 phase 4 wire unbal. load	2W3, 3 phase 3 wire unbal. load 3W3, 3 phase 3 wire unbal. load 3W4, 3 phase 4 wire unbal. load	1W, single phase 1W3, 3 phase 3 wire bal. load 1W4, 3 phase 4 wire bal. load
Approved by classification societies:	√	√	√

	ANSI code 32	ANSI code 32	
	RMQ-111D	**RMQ-121D**	
Main functions:	**Loss of excitation relay:** - protection of generators against loss of excitation - timer controlled tripping	**Overexcitation relay:** - protection of generator against over-excitation (over var) - timer controlled tripping	
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	
Meas. voltage (U_n): 57.7...690V AC	√	√	
Meas. current (I_n): 0.4...5.0A	√	√	
Frequency range: 40..45...65..70Hz	√	√	
Outputs:	1 maximum relay output Settings: -25...-25% of Q nom Delay: 0.4...20 s	1 maximum relay output Settings: 25...125% of Q nom Delay: 0.4...20 s	
Measuring system:	1var3, 3 phase 3 wire bal. load 1var4, 3 phase 4 wire bal. load	1var3, 3 phase 3 wire bal. load 1var4, 3 phase 4 wire bal. load	
Approved by classification societies:	√	√	

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	ANSI code 81	ANSI code 78	ANSI code 78
	RMF-112D	**LMR-111D**	**LMR-122D**
Main functions:	**Frequency relay:** - combined underfrequency/overfrequency protection - timer controlled tripping	**Loss of mains relay:** - detection of vector shift - generator disconnection on mains failure	**Loss of mains relay:** - detection of vector shift - detection of ROCOF (df/dt)
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	√
Meas. voltage (U_n): 57.7...690V AC	√	√	√
Meas. current (I_n): 0.4...5.0A	-	-	-
Frequency range: 40..45...65..70Hz	√	√	√
Outputs:	1 min. and 1 max. relay output Settings: ±10% of f nom, ±20% of f nom at f nom = 55Hz Delay: 0...10 s Nom. frequency: 50Hz, 55Hz, 60Hz	2 relay outputs Settings: 2...20 electr. deg. Delay: 0.5...5 s	2 relay outputs Settings: 2...20 electr. deg. / 0.3…5 Hz/s Delay: 0.5...5 s
Measuring system:	2 phase, single phase	2 phase, single phase	2 phase, single phase
Approved by classification societies:	√	√	√

	ANSI code 27, 59, 78, 81	
	G59	
Main functions:	**Protection relay package:** - combined vector shift and ROCOF - protection of over-/underfrequency - 3 phase protection of over-/undervoltage	
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	
Meas. voltage (U_n): 57.7...690V AC	√	
Meas. current (I_n): 0.4...5.0A	-	
Frequency range: 40..45...65..70Hz	√	
Outputs:	4 relay outputs, setting of set point: 2...20 electr. deg. / 0.3…5 Hz/s / 90…100% of f_n / 100…110% of f_n / 80…100% of U_n / 100…120% of U_n Hysteresis: 1…10% of U_n	
Measuring system:	2 phase, single phase: Vector shift, ROCOF, frequency, 3 phase 3 wire, U, 3 phase 4 wire: Voltage	
Approved by classification societies:	-	

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	ANSI code 25	ANSI code 25	
	FAS-113DG	**FAS-115DG**	
Main functions:	**Synchroniser:** - synchronisation of generator to busbar - circuit breaker time compensation	**Synchroniser:** - synchronisation of generator to busbar - voltage matching - circuit breaker time compensation	
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	
Meas. voltage (U_n): 57.7...690V AC	√	√	
Meas. current (I_n): 0.4...5.0A	-	-	
Frequency range: 40..45...65..70Hz	√	√	
Outputs:	Synch. pulse output: 1 relay output Freq. control outputs: 2 relay outputs	Synch. pulse output: 1 relay output Freq. control outputs: 2 relay outputs Voltage control: 2 relay outputs	
Measuring system:	2 phase, single phase	2 phase, single phase	
Approved by classification societies:	√	√	

	ANSI code 25	ANSI code 18	
	HAS-111DG	**EPN-110DN**	
Main functions:	**Paralleling relay:** - synchronisation of generator to busbar - setting of phase angle - setting of maximum frequency and voltage difference	**Electronic potentiometer:** - control of electronic governor - setting of integrating time - adjustment of output signal	
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	
Meas. voltage (U_n): 57.7...690V AC	√	-	
Meas. current (I_n): 0.4...5.0A	-	-	
Frequency range: 40..45...65..70Hz	√	-	
Outputs:	Synch. pulse output: 1 relay output	1 analogue output Settings: 0…±1V/0…±5V	
Measuring system:	2 phase, single phase	-	
Approved by classification societies:	√	√	

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	ANSI code 90	ANSI code 90	ANSI code 90
	LSU-112DG	**LSU-113DG**	**LSU-114DG**
Main functions:	**Load sharing unit:** - built-in power and freq. transducer - constant power or isochronous mode	**Load sharing unit:** - reverse power protection and low power detection - built-in power and freq. transducer - constant power or isochr. mode	**Load sharing unit:** - automatic start/stop outputs - built-in power and freq. transducer - constant power or isochronous mode
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√	√	√
Meas. voltage (U_n): 57.7...690V AC	√	√	√
Meas. current (I_n): 0.4...5.0A	√	√	√
Frequency range: 40..45...65..70Hz	√	√	√
Outputs:	Speed control: 2 relay outputs	Speed control: 2 relay outputs Reverse power protection: 1 relay output, fixed settings: -P> 5% / 5 s, -P> 5% / 10 s, -P> 10% / 5 s or -P> 10% / 10 s Low power detect.: 1 relay output, fixed setting: P<5%	Speed control: 2 relay outputs Start/stop: 2 relay outputs, fixed settings: P>80%, P<20%
Measuring system:	1W3, 3 phase 3 wire bal. load Single phase	1W3, 3 phase 3 wire bal. load Single phase	1W3, 3 phase 3 wire bal. load Single phase
Approved by classi-fication societies:	√	√	√

	ANSI code 90		
	LSU-122DG		
Main functions:	**var load sharing unit:** - built-in reactive power transducer - control of AVR - input for external voltage transducer		
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	√		
Meas. voltage (U_n): 57.7...690V AC	√		
Meas. current (I_n): 0.4...5.0A	√		
Frequency range: 40..45...65..70Hz	√		
Outputs:	Voltage control: 2 relay outputs		
Measuring system:	1var3, 3 phase 3 wire bal. load Single phase		
Approved by classi-fication societies:	√		

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Marine Bridge Instrumentation

	XL	BRW-2	BW
Types:	XL72, XL96, XL144, XL192	BRW-2	BW144, BW192
Panel cutout according to DIN:	Q72, Q96, Q144, Q192	–	–
Pointer deflection:	180°, 240°, 300°, 360°	180°, 240°, 300°, 360°	180°, 240°, 300°, 360°
Protection IP52/IP54:	IP52	–	–
Protection IP66:	On request	✓	✓
Built-in dimmer:	–	✓	✓
Long life LED illumin.:	✓	✓	✓
Accuracy class:	0.5	0.5	0.5
Scale base colour:	White or black	White or black	White or black
Figures, div. lines:	Black, yellow, red, green, etc.	Black, yellow, red, green. etc.	Black, yellow, red, green. etc.
Pointer:	Yellow illuminated or black shadow	Yellow illuminated or black shadow	Yellow illuminated or black shadow
Interface:	Analogue or CANopen	Analogue or CANopen	Analogue or CANopen
Type approved by:	MED	MED	MED

	Panorama Rudder Indicator	Panorama Rudder Indicator	
Types:	TRI-2 (Ø370)	RT-2	
Panel cutout according to DIN:	–	–	
Pointer deflection:	3 × 90°	0…90°, 0…140°	
Protection IP52/IP54:	IP54	IP66	
Protection IP66:	–	–	
Built-in dimmer:	✓	–	
Long life LED illumin.:	✓	–	
Accuracy class:	1.5	0.5	
Scale base colour:	White or black	–	
Figures, div. lines:	Black, yellow, red, green, etc.	–	
Pointer:	Black or yellow	–	
Interface:	Analogue	0…20mA or 4…20mA	
Type approved by:	MED	CCS, GL, GOST-R	

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	WSS	WSS-L	WSDI-2	
Description:	Wind Sensor Static	Wind Sensor Static	Display	
Supply voltage:	12V DC ±20%, max. 1.1A 24V DC ±20%, max. 0.6A	12V DC ±20%, max. 1.1A 24V DC ±20%, max. 0.6A	12/24V DC	
Internal heater:	✓	–	–	
Interface:	RS485 NMEA0183	RS485 NMEA0183	RS485 NMEA0183	
Measure:	**Relative Wind Speed** Range: 0…99.9 KTS Resolution: 0.1 KTS Response time: 1.0s **Direction** Range: 0…360° Resolution: 1° Accuracy: ±3° Response time: 1.0s	**Relative Wind Speed** Range: 0…99.9 KTS Resolution: 0.1 KTS Response time: 1.0s **Direction** Range: 0…360° Resolution: 1° Accuracy: ±3° Response time: 1.0s	**Speed** M/S Knots Beaufort **Direction** ±180°	
Display:	–	–	Speed: 4-digit 7-seg. display Direction: Analogue pointer	
Built-in dimmer:	–	–	✓	
Protection (IP):	IP66 (EN60529)	IP66 (EN60529)	IP66 (front) IP20 (terminals)	
Temperature range:	Operating -52°C …+60°C Storage: -60°C …+70°C RH: 0…100% Pressure: 600…1100hPa	Operating: 0°C…+60°C	–	
Dimensions:	12 × 12 x 19 cm	19 × 12 cm	17.2 × 17.2 × 7 cm	
Weight:	0.8 kg	0.8 kg	0.55 kg	
Approvals:	GL, DNV, CCS, GOST, RS Pending: RRR	GOST	Pending (CCS, DNV, GL, GOST, RS)	
Accessories:	IP66 connection box kit for cable extension IP67 connector kit for cable extension Extension cable 1…300 metres	IP66 connection box kit for cable extension IP67 connector kit for cable extension Extension cable 1…300 metres	IP66 rear cover	

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	WSDI	WSI		
Description:	Indicator	Interface box		
Supply voltage:	110 or 230V AC 50-60Hz	24V DC, 0.9A (+30% -25%)		
Heater:	–	–		
Supply internal heater:	–	–		
Interface:	RS422	TTL		
Measure:	Input: TTL Speed, dir. Output: RS422 NMEA0183	Input: RS485 NMEA0183 Output: 30V DC 0.6A to WSS / WSS-L Output: TTL 5V to WSDI		
Display:	Speed: 2½-digit 7-seg. display Direction: 64 LED I circle	–		
Built-in dimmer:	✓	–		
Protection (IP):	IP52 (front) IP20 (terminals)	IP40 (front) IP20 (terminals)		
Temperature range:	–	–		
Dimensions:	14.5 × 14.5 × 11 cm	10 × 7.5 × 11 cm		
Weight:	0.8 kg	0.45 kg		
Approvals:	GOST	GOST		
Accessories:	External dimmer unit/panel (1033290002)	DCP-2405 24V DC power supply (1240020003)		

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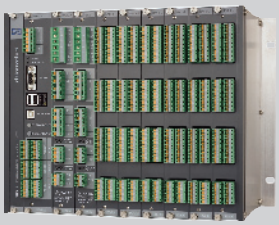
Renewable Energy Controls

	Delomatic Energy Control System, DM-4 REC-1		
			
Main function:	The DM4–REC (Renewable Energy Control system) is designed as a highly flexible, modular process controller covering the special demands of renewable energy plants regarding reliability, robustness, flexibility and remote access to functionality. Suitable for both wind power and hydropower applications.		

	Thyristor Control Module, TCM-2		
Main function:	Minimisation of grid impact at cut-in and cut-out.		
Aux. supply:	18-36V DC or 19.2-30V AC		
Operating temperature:	-25 to +70°C		
Protection class:	IP20		
Mounting:	Vertical or horisontal		
Thyristor ignition pulses:	500mA current limited, 100kHz, dI/dt 1 A/us, Gate cathode voltage 0-5V		
Grid:	110V AC to 690V AC (phase-to-phase) 40-70Hz		
Digital inputs:	9-36V DC		
RPM input:	9-36V DC		
Analogue input:	0-10V, 10kOhm		
Current measuring input:	-/1 or -/5Arms AC		
Current overload:	4 * In continuously 10 * In for 10 s		
Digital outputs:	9-36V DC		

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	Generator Protection Unit, GPU-2 Hydro	Generator Protection Unit, GPU-2	Generator Paralleling Controller, GPC-2
Aux.: 8-36V DC	✓	✓	✓
Meas. voltage: 100-690V	✓	✓	✓
Current transformer: -/1A or -/5A	✓	✓	✓
Frequency: 30-70Hz	✓	✓	✓
Loss of mains protection package	A	A	A
df / dt	A	A	A
Vector jump	A	A	A
Busbar and generator protection package	B1	B1	B1
Generator add-on protection package	C1	C1	C1
Zero + negative sequence	C2	C2	C2
Voltage control	D2	D2	D1
Var / cos phi control	-	-	D1
Analogue controller output	-	-	E1
Analogue transducer output	F	F	F
Combination outputs	-	-	EF
Start / stop relay output to next generator	-	G1	✓
Power management	-	-	-
AMF logic	-	-	-
Synchronising	G2	G2	✓
Load sharing	-	-	✓
Engine communication	-	H4/H5/H6	H4/H5/H6
Serial communication	H1/H2/H3	H1/H2/H3	H1/H2/H3
Remote mountable display	✓	✓	✓
Display / PC cables	J	J	J
IP54 protection of display	L	L	L
Available without display	✓	✓	✓
Configurable ext. cards	M	M	M
Engine protection	-	M1/M2	M1/M2
Approved by classification societies	✓	✓	-
BASE / DIN rail mounting	✓	✓	✓
Additional Operator Panel	-	-	-

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	Generator Protection Unit, GPU-3 Hydro		
Aux.: 8-36V DC	✓		
Meas. voltage: 100-690V	✓		
Current transformer: -/1A or -/5A	✓		
Frequency: 30-70Hz	✓		
Remote mountable display	✓		
Approved by classification societies	✓		
BASE / DIN rail mounting	✓		
Start / stop relay output to next generator	✓		
Busbar and generator protection package	✓		
M-logic (micro PLC)	✓		
Synchronising	Option		
IP 54 protection of display	Option		
Loss of mains protection package	Option		
Additional displays (DU-2)	Option		
Voltage control	Option		
Generator add-on protection package	Option		
Analogue transducer output	Option		
Engine communication	Option		
Serial communication	Option		
Configurable ext. cards	Option		
Engine protection	Option		
Analogue controller output	Option		
Combination outputs	Option		
Additional Operator Panel (AOP-1/AOP-2)	Option		
TCP/IP modbus	Option		
Class 0.5 measurement	Option		

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Switchboard Instrumentation

	Battery Charger, DCP2-1205	Battery Charger, DCP2-2405	Battery Charger, DCP2-1210
Main function:	The DCP2 can be applied as battery charger or as a universal DC voltage supply.	The DCP2 can be applied as battery charger or as a universal DC voltage supply.	The DCP2 can be applied as battery charger or as a universal DC voltage supply.
Input voltage:	1 x 230V AC ±15% 47...63Hz	1 x 230V AC ±15% 47...63Hz	1 x 230V AC ±15% 47...63Hz
Output voltage:	12V DC (adjustable 11.8…13.8V DC)	24V DC (adjustable 23.5…27.5V DC)	12V DC (adjustable 11.8…13.8V DC)
Output current:	5A (typical current limit 6A)	5A (typical current limit 6A)	10A (typical current limit 12.5A)
Protection:	IP20	IP20	IP20
Size:	147 x 123 x 86 mm	147 x 123 x 86 mm	205 x 123 x 86 mm
Weight:	Approx. 0.8 kg	Approx. 0.8 kg	Approx. 1.2 kg

	Battery Charger, DCP2-2410	Battery Charger, DCP2-2420	Battery Charger, DCP2-2420
Main function:	The DCP2 can be applied as battery charger or as a universal DC voltage supply.	The DCP2 can be applied as battery charger or as a universal DC voltage supply.	The DCP2 can be applied as battery charger or as a universal DC voltage supply.
Input voltage:	1 x 115V AC ±15% 1 x 230V AC ±15% 47...63Hz	1 x 230V AC ±15% 47...63Hz	3 x 400/480V AC ±15% 47...63Hz
Output voltage:	24V DC (adjustable 23.5…27.5V DC)	24V DC (adjustable 23.5…27.5V DC)	24V DC (adjustable 23.5…27.5V DC)
Output current:	10A (typical current limit 12.5A)	20A (typical current limit 25A)	20A (typical current limit 25A)
Protection:	IP20	IP20	IP20
Size:	205 x 123 x 86 mm	240 x 153 x 86 mm	240 x 153 x 86 mm
Weight:	Approx. 1.2 kg	Approx. 1.9 kg	Approx. 1.9 kg

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	Battery Charger, DCP2-2440		
Main function:	The DCP2 can be applied as battery charger or as a universal DC voltage supply.		
Input voltage:	3 x 400/480V AC ±15% 47...63Hz		
Output voltage:	24V DC (adjustable 23.5…27.5V DC)		
Output current:	40A (typical current limit 45A)		
Protection:	IP20		
Size:	292 x 185 x 130 mm		
Weight:	Approx. 3.6 kg		

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	Measuring CT: ASR/ASK/ EASR/EASK	Split core CT: KBU	Summation CT: KSU/SUSK	Primary winding CT: WSK	Protection CT: SASR/SASK
Primary current	30 – 7,500 A	100 – 5,000 A	1 or 5 A	1 – 100 A	50 – 2,000A
Secondary current	5 or 1 A	5 or 1 A	5 or 1 A	5 or 1 A	5 or 1 A
Burden	1.0 – 45 VA	1.25 – 30 VA	15 – 30 VA	2.5 – 15 VA	1.0 – 15 VA
Acc. class/ protection class	0.2S – 0.2 – 0.5S – 0.5 – 1.0	0.5 – 1.0	0.5 – 1.0	0.5 – 1.0	5P4 – 5P5 – 5P10 – 10P5 – 10P10
Standards	DIN VDE 0414/1; DIN 42600; and DIN EN 60044/1 edition 12/2003 as well as regulation VBG 4				
Insulation class	E (120˚C max.)				
Ambient temperature	-5 – 55˚C				
Storage temperature	-25 – 70˚C				
Rated maximum operating voltage	Um ≤ 0.72 kV				
Test voltage	Um ≤ 0.72 kV				
Operating frequency	50 and 60 Hz (16 2/3 Hz up to 400 Hz on request)				
Class of accuracy	0.2S – 0.2 – 0.5S – 0.5 – 1.0				
Rated secondary current	5 A or 1 A				
Thermal short circuit current (I_{TH})	$I_{TH} = 60 \times I_N$				
Dynamic short circuit current (I_{dyn})	$2.5 \times I_{TH}$				
Continuous overcurrent	$1.0 \times I_N$ ($1.2 \times I_N$ available on request)				
Security factor (FS)	FS 5 up to 1500 A nominal current – FS 10 from 1600 A nominal current				
Accessories	DIN-rail mounting – Mounting kit – Copper tubes – Secondary cap Locking pistons – Sealed shutters – Copper busbars				
Various	• Unbreakable plastic housings • Black polycarbonate • Flame resistant • Self-extinguishing • Transformer housings are ultrasonically welded • Nickel-plated secondary terminals with plus-minus nickel-plated screw M 5 × 10mm • Integrated secondary locking caps				

FOR DETAILED INFORMATION – PLEASE SEE WWW.DEIF.COM

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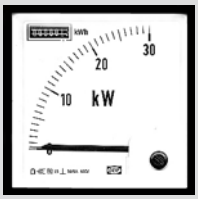
	kWh or kvarh Meters WQ2R96	kWh or kvarh Meters WQR96-x	kWh or kvarh Meters WQR96-c
			
Main function:	Measurement of power or reactive power	Measurement of power or reactive power	Measurement of power or reactive power
Size (mm):	Q96	Q96	Q96
Mounting:	Panel	Panel	Panel
Pointer deflection:	-	90°	240°
Protection:	IP52	IP52	IP52
Accuracy class:	1 (IEC1036)	1 (IEC1036)	1 (IEC1036)
Connection	1W, 1W3, 1W4, 2W3, 3W3 (4)	1W, 1W3, 1W4, 2W3, 3W3 (4)	1W, 1W3, 1W4, 2W3, 3W3 (4)
Frequency:	45...65Hz	45...65Hz	45...65Hz
Measuring range:	Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 57-100-230-400V AC	Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 57-100-230-400V AC	Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 57-100-230-400V AC
Pulse outputs:	2 relays	1 relay	1 relay

	kWh or kvarh Meters WQR96	Energy Meters (kWh) TAE-2	DC Integrators / Pulse-transmitters, DCF-Q96
Main function:	Measurement of power or reactice power.	DIN-rail meter with a 6-digit register for accumulated measurement of energy.	Accumulates momentary measurements from a transducer into reading of fx kWh or Ah.
Size (mm):	Q96	90 x 105	103 x 92
Mounting:	Panel	DIN rail	Panel or base
Protection:	IP52	IP20	IP52
Accuracy class:	1 (IEC 1036)	1	0.5
Connection:	1W, 1W3, 1W4, 2W3, 3W3 (4)	3 phase 3 wire, 2 external C.T.'s 3 phase 4 wire, 3 external C.T.'s Single phase, 1 external C.T.	-
Measuring current:	-	-/1A or -/5A	-
Measuring voltage:	-	3 x 230V/400V AC -20/+25% or 3 x 132V/230V AC -20/+25%	-
Measuring range:	Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 57-100-230-400V AC	30...2000/1A or 5A	1V..10V DC, 1…20mA, 4…20mA
Frequency:	45...65Hz	45...65Hz	-
Auxiliary voltage:	-	-	100...440V AC ±20%, 24V DC ±25%
Pulse outputs:	1 relay	Relay contact	1 relay

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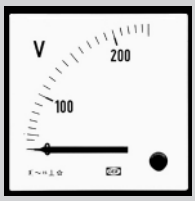
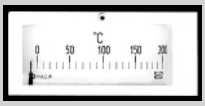
	Moving Coil, DQ	Moving Coil, VDQ	Moving Iron, EQ
	(240˚)	 (90˚)	
Main function:	Measurement of DC currents and DC voltages.	Measurement of AC currents and AC voltages.	Measurement of AC currents and AC voltages, adjusted for other frequency range 16..65Hz. The instruments measure true RMS.
Size (mm):	Q48...Q144	Q72...Q144	Q48...Q144
Pointer deflection:	90˚, 240˚	90˚, 240˚	90˚
Customised and exchangeable scale available for 90˚:	✓	✓	✓
Protection IP52:	✓	✓	✓
Protection IP54 on request:	✓	✓	✓
Accuracy class:	1.5	1.5	1.5
Measuring range:	60mV...300V 1mA...5...10...15...40A, 4...20mA (except from Q48: 1mA..600mA, 4...20mA)	25...300V, 1...600mA	40...800V (Q48: 40...300V) 1...60A (Q48: 1...40A)
Approved by classi-fication societies:	✓	✓	✓

	Edgewise Moving Coil, DPR	Slim Edgewise Moving Coil, DSM	
			
Main function:	Measurement of DC currents and DC voltages.	Measurement of DC currents and DC voltages.	
Size (mm):	48 x 24, 72 x 36, 96 x 48, 144 x 72 (vertical or horizontal)	72 x 24, 96 x 24, 144 x 36 (vertical or horizontal)	
Pointer deflection:	-	-	
Customised and exchangeable scale available for 90°:	✓	✓	
Protection IP52:	✓	✓	
Protection IP54 on request:	-	-	
Accuracy class:	1.5	1.5	
Measuring range:	1...600V 1...600mA, 4...20mA	60mV...600V (DSM72) 60mV...100V (DSM96) 60mV...300V (DSM144) 1...600mA, 4-20mA	

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	Ammeters w/built-in switch, VDQ96-sw	Voltmeters w/built-in switch, EQ96-sw7	Voltmeters w/built-in switch, EQ96-sw4
Main function:	Measurement of AC currents. Selected with built-in switch, measurement of current in a 3-phase network is possible.	Measurement of AC voltages. Selection of measurement of phase to phase voltage or phase to zero voltage in a 3-phase network is possible by means of built-in switch.	Measurement of AC voltages. Measurement of phase to phase voltage in a 3-phase network is possible by means of built-in switch.
Size (mm):	Q96	Q96	Q96
Pointer deflection:	90°	90°	90°
Customised and exchangeable scale available for 90°:	✓	-	-
Protection IP52:	✓	✓	✓
Protection IP54 on request:	-	-	-
Accuracy class:	1.5	1.5	1.5
Measuring range:	0...1A, 0...5A or from current transformer(s) Scale: According to the used current transformer Frequency: 45...65Hz	Phase to phase voltages up to 600V or phase to zero voltages up to 350V Scale: 0...300V, 0...500V, 0...600V, 0...800V, 120V for VT - x/100V, 132V for VT - x/110V, Frequency: 40...60Hz	Phase to phase voltages up to 600V or phase to zero voltages up to 350V Scale: 0...300V, 0...500V, 0...600V, 120V for VT - x/100V, 132V for VT - x/110V, Frequency: 40...60Hz

	Bimetallic Instruments, BQ	Combined Ammeters, BEQ	
Main function:	Measurement of currents. Provided with a maximum-reading pointer.	Measurement of currents. Combined bimetallic system and moving iron system for maximum and momentary reading. Provided with a maximum-reading pointer.	
Size (mm):	Q48, Q72, Q96	Q72, Q96	
Pointer deflection:	90°	90°	
Customised and exchangeable scale available for 90°:	-	-	
Protection IP52:	✓	✓	
Protection IP54 on request:	-	-	
Accuracy class:	3	3 (1.5 for moving iron)	
Measuring range:	Measuring range: 0...6A or 0...1.2A Overload: 1.2 x nominal current (-/5A or -/1A) continuously Scale: Always 120% of the current transformer Setting time: BQ48: 4 or 8 min, BQ72-x/BQ96-x: 8 or 15 min	Measuring range: 0...6A or 0...1.2A Overload: 1.2 x nominal current (-/5A or -/1A) continuously Scale: Always 120% of the current transformer Setting time: Bimetallic system: 8 or 15 min	

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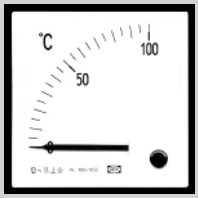
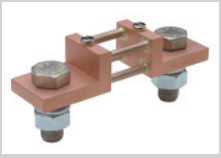
	Watt or var Meters, WQ	Power Factor Meters, PFQ	PT100Ohm Temperature Meters, PTQ
			
Main function:	Measurement of power or reactive power.	Measurement of CosPhi.	Measurement of temperature.
Size (mm):	Q96, Q144	Q96, Q144	Q96, Q144
Pointer deflection:	90°, 240°	90°, 240°	90°, 240°
Customised and exchangeable scale available for 90°:	✓	✓	✓
Protection IP52:	✓	✓	✓
Protection IP54 on request:	✓	✓	✓
Accuracy class:	1.5	1.5	1.5
Measuring range:	Frequency: 45...65Hz Measuring current: Direct or from CT -/1A or -/5A Measuring voltage: 100...110...127...220...230...240...380 ...400...415...440...450...480V AC	0.5 cap. ...1...0.5 ind.,0.7 cap. ...1... 0.3 ind., 0...1 cap., 0...1 ind. Voltage: 57.7...63.5...100...110...124.. .220...230...240...380...400...415... 440V AC ±20% Current (Inom): -/1A and -/5A from external current transformer	PT100 ohm sensor, 2 or 3 wire: Different ranges available within the range of 0...800°C Min. temperature difference: 25°C Min./max. temperature: -200°C/+800°C Aux. supply: 24...48...110...220V AC (AC: 1VA, DC: 15mA)

	Pointer Frequency Meters, FQ	Reed Frequency Meters, FTQ	Shunt Resistors
			
Main function:	Measurement of frequency.	Measurement of frequency with 13 or 21 reeds.	Dimensions: To DIN 43703 Ranges: 1...2500A, 60/150mV Form A and B: 60/150mV Form C: 50mV
Size (mm):	Q72, Q96	Q72, Q96	-
Pointer deflection:	90°	-	-
Customised and exchangeable scale available for 90°:	✓	✓	-
Protection IP52:	✓	✓	-
Protection IP54 on request:	✓	✓	-
Accuracy class:	0.5	0.5	0.5
Measuring range:	Measuring voltage: 85...265V AC or 340...506V AC Scale/meas. range: 45...55Hz, 55...65Hz, 45...65Hz (Others on request)	Measuring voltage: 100...110...220... 230...240...380...400...415... 440V AC ±15% Scale/meas. range: 47...53Hz, 45...55Hz, 57...63Hz, 55...65Hz	-

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	Multi-instrument, MIQ96-2	Multi-instrument, MIC	Multi-instrument, MIB
Size (mm):	Q96	Q96	Q96
Main function:	Measurement of voltage, current, active-, reactive- and apparent power, frequency and energy import (kWh, kvarh), export (kWh, kvarh), PF, THD, MD (max. demands).	Measurement of voltage, current, active-, reactive- and apparent power, frequency, energy kWh/kvarh (import, export, net, total), PF, THD.	Measurement of voltage, current, active-, reactive- and apparent power, frequency, energy kWh/kvarh (import, export, net, total), min./max. values, PF, THD.
Connection:	Single phase 3-phase 3 wire balanced load 3-phase 4-wire balanced load 3-phase 3-wire unbalanced load 3-phase 4-wire unbalanced load	Suitable for all 3-phase network topologies	Suitable for all 3-phase network topologies
Accuracy class:	0.5 of most values 1.0 of a few values	0.2 measured values 0.5 calculated values	0.5% on measured values 1.0% on calculated values
Output:	RS485 serial + 2 relays Pulse output/limit switches	RS485 serial output with Modbus RTU protocol. Optional: 2 digital pulse/limit outputs + 2 relays	Optional: 2 digital pulse/limit outputs Optional: RS485 serial output with Modbus RTU protocol
Measuring current:	-/1A or -/5A	-/1A or -/5A	-/1A or -/5A
Measuring voltage:	230V AC N-Ph (400V AC Ph-Ph) 50/60Hz	230V AC N-Ph (400V AC Ph-Ph) 50/60Hz	400V AC Ph-N/690V AC Ph-Ph 50/60Hz
Auxiliary supply:	Universal AC/DC power supply 40…276V AC, 40…65Hz <5VA or 19…300V DC <5W	85…264V AC 50/60Hz / 24…48, 100…280V DC	100…415V AC 50/60Hz 100...300V DC

	DIN Rail Instruments, D45	DIN Rail Instruments, E45	DIN Rail Instruments, B45
Main function:	Moving coil DC instrument for DIN rail mounting (35 x 15 mm).	Moving iron AC instrument for DIN rail mounting (35 x 15 mm).	Bimetallic instrument with maximum reading pointer. For DIN rail mounting (35 x 15 mm).
Size (mm):	Q45	Q45	Q45
Pointer deflection:	90°	90°	90°
Customised and exchangeable scale available for 90°:	✓	✓	✓
Protection IP52:	✓	✓	✓
Protection IP54 on request:	-	-	-
Accuracy class:	1.5	1.5	3.0
Measuring range:	1V...300V (incl. 0...60mV/5mA) 1mA...600mA and (4...20mA)	6V...400V, 100mA...25A Standard ranges: 1...5...10...15...25A, incl. -/1A and -/5A for external CT	Nominal current -/5A. Overload: 1.2 x nominal current continuously. Scale: Always 120% of the current transformer. Setting time: 8 min

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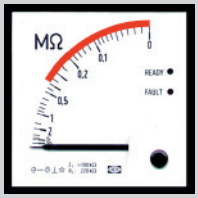
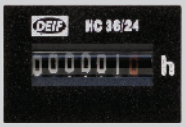
	Insulation Monitor, ADL-111Q96	Selectable Insulation Monitor, SIM-Q/SIM-Q LF	Insulation Monitors, AAL-111Q96
			
Main function:	Supervision of the insulation resistance between an insulated low-voltage distribution network and earth cable/safety cable.	Supervision of the insulation resistance between an insulated low-voltage distribution network and earth cable/safety cable.	Supervision of the insulation resistance between an insulated low-voltage distribution network and earth cable/safety cable.
Size (mm):	Q96	Q96	Q96
Selectable modes:	-	Monitoring, fault finding, test	-
Customised and exchangeable scale available:	-	✓	✓
Protection:	IP52	IP52	IP52
Accuracy class:	-	1...0Mohm scale ±5% of scale length 10...0Mohm scale ±2% of scale length	±2% of scale length
Relay output:	Built-in relay can either be selected as NE or ND. Alarm set point adjustable from the rear	Built-in relay can either be selected as NE or ND. Alarm set point adjustable from the rear	Built-in relay. Alarm set point adjustable from the rear
Input:	Meas. voltage: ±12V DC ±5% (24V), ±28V DC ±5% (110, 220V) Mains voltage: 24V DC, 110V DC, 220V DC +30% -25%	Meas. voltage: ±28V DC ±5% Mains voltage: Max. 690V AC +20% continuously SIM-Q: 20Hz...500Hz SIM-Q LF: 5Hz...500Hz	Meas. voltage: 12V DC ±10% Mains voltage: Max. 440V AC +20% continuously
Mains voltage/ leakage cap.:	Selectable for either max. 1µF or max. 20µF	Selectable for either max. 50µF or max. 500µF	-
Auxillary supply:	24V DC, 110V DC, 220V DC +30% -25%	100...110...127 or 220...230...240 or 400...450...480V AC ±20% 40...70Hz (< 4VA) 24V DC ±25% (appr. 4W)	110...220...380...415...440V AC ±20%, 45...65Hz (appr. 4VA), 24V DC ±25% (appr. 4W)
Approved by classi-fication societies:	✓	✓	✓

	Remote Position Indicators, PIR25-1, PIR25-2	Running Hours Counters, HC48	Running Hours Counters, HC36/24
			
Main function:	Indication of circuit breaker position or tie breaker position.	For AC or DC measuring voltage.	Synchronous motor (AC). Step motor (DC). For panel mounting.
Size (mm):	Q25	Q48 Adapter frames 55 x 55 or 72 x 72	36 x 24
Black focusing screen ("round"):	✓	-	-
White focusing screen ("square"):	✓	-	-
Frequency 50Hz or 60Hz:	-	✓	✓
Protection IP40:	-	(Special IP65 available)	✓
Accuracy class:	-	AC: 1/100 hour (36 s) DC: 1/10 hour (6 min)	-
Measuring range:	Nominal voltages: 4...48...110...230V AC/DC	Counting range: AC: 99999.99 hours / DC: 999999.9 hours Voltage: 24-110-230V AC ±10% and 10-48V DC, 110V DC ±10%	Counting range: AC: 99999.99 hours / DC: 999999.9 hours - automatically resets to zero Voltage: 24...110...230V AC ±10% and 12...36V DC, 110V DC±10% Resolution: For AC - 1/100 hours (36 s), for DC - 1/10 hours (6 min)

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	Alarm Panels, AL8-2		
Main function:	Suitable to switchboards in industrial and marine plants for alarm and control purposes.		
Size (mm):	Q96		
Selectable modes:	-		
Customised and exchangeable scale available:	-		
Protection:	IP54		
Accuracy class:	-		
Relay output:	Two user configurable output relays One output for horn (alarm)		
Input:	8 alarm inputs		
Mains voltage/ leakage cap.:	-		
Auxillary supply:	12...24...48...110V DC ±25% (min. 10V DC)		
Approved by classi-fication societies:	✓		

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	Current Transducers, TAC-311DG	Current Transducers, TAC-321DG	
Size, DIN rail (mm):	55 × 75	55 × 75	
Accuracy class:	0.5	0.5	
Connection:	Single phase	Single phase	
Measuring principle:	Average measurement	Average measurement	
Measuring current:	1.0…7.25A AC (≤1.2VA)	0…1A AC (≤2.0VA) 0…5A AC (≤2.3VA)	
Measuring voltage:	–	–	
Measuring range:	0…100% I nom	0…100% I nom	
Meas. frequency:	45…65Hz	45…65Hz	
Output (0…100%):	0…5, 0…10, 0…20mA DC, 0…10V DC Span adjustment ±20% of FS output Zero adjustment for all span adjustments	0…10, 0…20mA DC Span adjustm. +10% -20% of FS output	
Output (20…100%):	4…20mA, Output limit <22mA Span adjustm. ±20%, Zero adjustm. ±20%	–	
Output (±100%):	–	–	
Auxiliary supply:	110/230/440V AC ±20% ≤2.5VA 24V DC -25/+30% ≤2W 48…110, 88…220V DC -25/+30% ≤2W	No separate auxiliary supply	

	Voltage Transducers, TAV-311DG	Voltage Transducers, TAV-321DG	
Size, DIN rail (mm):	55 × 75	55 × 75	
Accuracy class:	0.5	0.5	
Connection:	Single phase	Single phase	
Measuring principle:	Average measurement	Average measurement	
Measuring voltage:	57.7…500V AC (≤0.3VA) 88…132V AC (≤0.3VA)	57.7-500V AC (≤2.8VA)	
Measuring range:	0…100% U nom/67…100% U nom	0-100% U nom	
Meas. frequency:	45…65Hz	45-65Hz	
Output (0-100%):	0…5, 0…10, 0…20mA DC, 0…10V DC Span adjustment ±20% of FS output Zero adjustment for all span adjustments	0…10, 0…20mA DC 0…10V DC Span adjustm. +10% -20% of FS output	
Output (20-100%):	4…20mA, Output limit <22mA Span adjustm, ±20%, Zero adjustm. ±20%	–	
Auxiliary supply:	110/230/440V AC ±20% ≤2.5VA 24V DC -25/+30% ≤2W 48…110, 88…220V DC -25/+30% ≤2W	No separate auxiliary supply	

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	Selectable AC-transducers, TAS-331DG	Selectable AC-transducers, TAS-311DG
Size, DIN rail (mm):	99.7 × 75	99.7 × 75
Accuracy class:	0.5	0.5
Connection:	Single phase and 3 phase network	Single phase
Measuring principle:	RMS	RMS
Measuring voltage:	57…690V AC <1VA	57…690V AC <1VA
Measuring range:	0…P/Q - P/Q…0…P/Q	0…57V/690V, 0…0.5A/8A, 20…80Hz
Meas. frequency:	20…80Hz	20…80Hz
Output (0…100%):	0…1mA, 0…5mA, 0…10mA, 0…20mA 0…1V, 0…5V 0…10V	0…1mA, 0…5mA, 0…10mA, 0…20mA 0…1V, 0…5V 0…10V
Output (20…100%):	0.2…1mA, 1…5mA, 2…10mA, 4…20mA 0.2…1V, 1…5V, 2…10V	0.2…1mA, 1…5mA, 2…10mA, 4…20mA 0.2…1V, 1…5V, 2…10V
Output (±100%):	±1mA, ±5mA, ±10mA, ±20mA, ±1V, ±5V, ±10V	±1mA, ±5mA, ±10mA, ±20mA ±1V, ±5V, ±10V
Output (±10…100%):	0.1…1mA, 0.5…5mA, 1…0mA, 2…20mA 0.1…1V, 0.5…5V, 1…10V	0.1…1mA, 0.5…5mA, 1…10mA, 2…20mA 0.1…1V, 0.5…5V, 1…10V
Auxiliary supply:	57…690V AC/24…220V DC	57…690V AC/24…220V DC

	Selectable AC-transducers, TAS-321DG	Temperature transducers, TEMAX-3
Size, DIN rail (mm):	99.7 × 75	200 × 190, base mounting
Accuracy class:	0.5	1.0
Connection:	Single phase and 3 phase network	2-wire transducer for remote monitoring of 2, 3 or 4 tempera-tures
Measuring principle:	RMS current with sign	PT100Ω sensors, 2-wire
Measuring voltage:	57…690V AC <1VA	–
Measuring range:	-8/-0.5A…0.5/8A, 0…P/Q -P/Q…0…P/Q	0…150°C/0…200°C (other ranges on request)
Meas. frequency:	20…80Hz	–
Output (0-100%):	0…1mA, 0…5mA, 0…10mA, 0…20mA 0…1V, 0…5V 0…10V	4…20mA
Output (20-100%):	0.2…1mA, 1…5mA, 2…10mA, 4…20mA 0.2…1V, 1…5V, 2…10V	–
Output (±100%):	±1mA, ±5mA, ±10mA, ±20mA, ±1V, ±5V, ±10V	–
Output (±10-100%):	0.1…1mA, 0.5…5mA, 1…10mA, 2…20mA 0.1…1V, 0.5…5V, 1…10V	–
Auxiliary supply:	57…690V AC/24…220V DC	13…36V DC
Protection:	–	IP65

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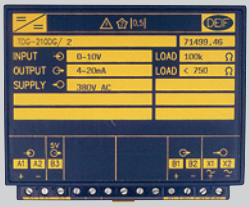
	DC/DC Insulation Amplifiers, TDG-210DG	
		
Main function:	Converting one type of DC signal into another DC signal, separating a number of earthing points, galvanic separation of current signals, conversion of measuring signal, adaption of measuring range, separation of measuring circuits, measuring on DC shunts or measuring of DC voltages.	
Size, DIN rail (mm):	108 × 98.4	
Accuracy class:	0.5	
Connection:	–	
Measuring principle:	–	
Measuring voltage:	–	
Current standard input:	Different ranges available within the limit of ±1-50mA	
Voltage input:	Different ranges available within the limit of ±60mV-400V	
Measuring range:	–	
Meas. frequency:	–	
Output (0…100%):	0…1mA, 0…5mA, 0…10mA, 0…20mA 0…1V, 0…10V	
Output (20…100%):	0.2…1mA, 1…5mA, 2…10mA, 4…20mA 0.2…1V, 2…10V	
Output (-100…0…100%):	±1mA, ±5mA, ±10mA, ±20mA, ±1V, 10V	
Auxiliary supply, DC: Auxiliary supply, AC:	24…48…110…220V DC (2.5W) DC/DC 57.7…440V AC ±20%, 3.5VA (45…65Hz)	

	Multi-Transducers, MTR-2, MTR-2F	
Size (mm):	100 × 75 (35 mm DIN-rail)	
Main function:	Measurement of voltage, current, directional current, active-, reactive- and apparent power, CosPhi, frequency, THD, demand functions	
Connection:	Single phase, 3-phase 3-wire balanced load, 3-phase 4-wire balanced load, 3-phase 3-wire unbalanced load, 3-phase 4-wire unbalanced load	
Accuracy class:	0.5	
Output:	0 analogue, RS485 Modbus (MTR-2-015) 2 analogue, RS485 Modbus (MTR-2F-215) 3 analogue, RS485 Modbus (MTR-2-315) 4 analogue, RS485 Modbus (MTR-2-415)	
Measuring current:	-/1A or -/5A	
Measuring voltage:	87…866V AC phase - phase	
Auxiliary voltage, DC:	19…300V DC	
Auxiliary supply, AC:	40…276V AC	
Response time:	MTR-2 <300 ms, MTR-2F <50 ms	
Output types:	All between -20…20mA and between -10…10V Example: 4…12…20mA or 0…1V	

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Replacements

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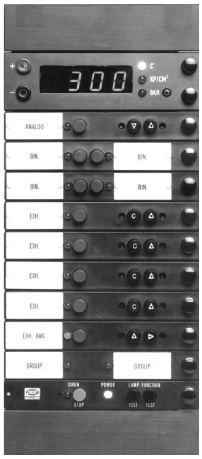
DEIF A/S

Alarm and monitoring system

Type MALLING 845

4921230013C



- *Flexible cassette system with exchangeable modules, easily installed and serviced*
- *Input modules for binary and analog sensors and output module for control of siren and group alarms*
- *Common digital instrument*
- *Indicating instruments may be connected to all analog modules*
- *Over 1000 marine installations*
- *Type approved by major classification societies*

CE

Application

The alarm and monitoring system type MALLING 845 is CE marked for residential, commercial and light industry plus industrial environment, and is applied for:

Measurement and monitoring — The alarm and monitoring system type MALLING 845 is designed to measure and monitor analog and binary values such as temperature, pressure, tank level, etc. in machinery and auxiliary equipment, primary on board ships.

Alarm indication — When the preset alarm limits are exceeded, external audible/visual indicators are activated. Red LEDs and legend plates identify the individual alarms.

Functions

Alarm sequence

- arisen alarm — When an alarm arises, the alarm and monitoring system activates the common siren relay, and affected channels are marked by red flashing of the LEDs.
- siren reset — The siren signal is reset by means of a common push-button. The individual alarms can not be acknowledged on the actual function modules until the siren has been stopped.
- alarm ack./steady alarm — When acknowledged, the LEDs change to a steady light which remains, until the condition has returned to normal. The alarm and monitoring system indicates all newly arisen alarms by flashing LED until acknowledged.

Read-out — Analog measuring values and alarm limits plus the measuring unit are easily read on the common digital instrument. The display is activated by means of push buttons in the front plates of the relevant modules.

Function test

- lamp test
- common function test
- individual function test

Lamp test and common function test may be carried out from the siren and test module. Individual function test, independent of an alarm inhibit if any, may be carried out from the individual modules.

Time delay — Most standard function modules are available in a "DL" version with a continuously adjustable time delay, 1..25 s.

Alarm limits — The individual alarm limits of analog channels are set by means of a screwdriver through small holes in the front plates, easily accessible beside those push-buttons used to read out the alarm limits on the digital instrument.

Alarm inhibit — An alarm may be inhibited if the alarm is unwanted for e.g. low lubricating oil pressure during shutdown of an engine. For all binary, Pt100Ω and 4..20mA channels the alarms may be inhibited by a make contact, which may be common to a number of alarm channels.

Group alarm — The alarms are normally split up into groups according to their importance and are shown on the group alarm modules, on a group alarm panel on the bridge and possibly in the accommodation as well. The group alarm panel is equipped with a lamp for each group plus a buzzer.

Every time a new alarm arises in a group, the relevant group lamp will start flashing at full intensity and the buzzer is activated. When reset on the bridge, the buzzer is stopped and the flashing is dimmed to the light intensity determined by the dimmer. When the siren is reset in the control room, the flashing of the group lamp changes to a steady light, remaining until all alarms in the group have been remedied. The group outputs of the individual channels in each group are connected in parallel to the input of the relevant group amplifier.

Construction

System components — An alarm and monitoring system type MALLING 845 consists of one or more cassettes mounted with common auxiliary modules and individual function modules. Connections to and from the system plus internal codings are made by means of screw terminals on the rear of the cassettes. The cassettes are mutually connected by means of extension cables with connectors.

Cassettes — The standard cassette is a 19" rack for vertical mounting, designed to accommodate 21 modules. A smaller version (a "half cassette") accommodates 12 modules.

As modules — The alarm and monitoring system type MALLING 845 may be delivered as separate modules, however DEIF A/S does not guarantee the performance of systems configured by another company.

Ready-wired systems — Larger systems are typically delivered as prewired systems supplied with fixed cables and terminals to be mounted in a control desk. Internal wiring, codings and settings plus final test are carried out according to the customer's alarm and measuring points list.

Bulkhead mounting — The systems may furthermore be delivered mounted in a cabinet for bulkhead mounting. A power supply and a duty selector switch may be mounted, if required. Please contact DEIF A/S for further information.

Common auxiliary modules

- siren and test module — The siren and test module contains the most important common functions of the system: siren relay, push-buttons for SIREN STOP, COMMON FUNCTION TEST and LAMP TEST plus LEDs for "SIREN" and "POWER ON". An external push-button for reset of siren may be connected.
- earth fault module — The earth fault module monitors the leakage to earth.
- group alarm module — By means of the group alarm modules the alarms may be grouped according to their priority and function. Two alarm groups per group alarm module.
- blank module — The blank modules are used to cover spare places in the cassette.

Binary function modules — The binary alarm modules are designed to monitor potential free (ON/OFF) alarm contacts in thermostats, pressure monitors and level switches, etc. Each binary alarm module contains two alarm circuits.

Analog function modules

- Pt100Ω modules — Standard analog temperature modules for Pt100Ω sensor are designed to measure and monitor e.g. cooling water and lubricating oil temperatures.
- 4..20mA modules — Standard analog modules for 4..20mA transducers are used to measure e.g. signals from pressure and temperature transducers.
- alarm limits — Each analog module for Pt100Ω and 4..20mA is provided with one low and one high alarm limit.

Instrument module — The analog measuring values and alarm limits with the measuring unit are easily read on the common digital instrument. Measuring values are shown in a large, red 7-segment display. The display is activated by means of push buttons in the front plates of the relevant modules. The instrument module occupies two spaces in the cassette.

Exhaust temp. monitoring — For each of the cylinders of the diesel engine the system monitors that the exhaust gas temperature does neither exceed an adjustable, fixed high alarm limit, nor deviates too much from the other exhaust gas temperatures.

- cylinder exhaust temp. module — The temperature after each cylinder is measured by means of a cylinder exhaust temperature module in conjunction with a NiCr-Ni thermocouple.
- average value module — The average temperature value is calculated by means of an average value module.
- deviation alarm — The individual cylinder temperatures are compared with the average value and an alarm will be released, if the deviation exceeds the preset value. Allowable deviation from the average value is conveniently set during the sea trial at an average temperature corresponding to normal service conditions.
- temperature equalization — As the individual cylinder temperatures may differ from each other due to thermodynamic conditions in the engine and the various placings of the temperature sensors, each cylinder temperature module is provided with an equalizing potentiometer by means of which the contribution of the individual cylinders to the average value may be adjusted. During the sea trial the contributions of the individual cylinders are set to the average value.

  In order to avoid unwanted alarms caused by heavy variations of the temperature during start and stop, the deviation alarms are automatically inhibited at low temperatures. In case of sensor failure the monitoring of the relevant cylinder temperature may be by-passed.
- direct connection — NiCr-Ni temperature sensors may be connected by means of a compensating cable from the sensors to the alarm cassette.
- connection through comp. box — A better and less expensive installation is, however, usually obtained by using ordinary installation cables between a common junction box by the engine frame and the alarm cassette. Normally an existing junction box may be used. Compensation of the ambient temperature is carried out by means of a Pt100Ω module in conjunction with a Pt100Ω sensor in the junction box.
- high temperature module — To monitor the temperature after the turbocharger a high temperature module with one high alarm set point but without deviation alarm may be used.

Slave lamps — Smaller installations, e.g. on the bridge, are sometimes delivered for connection of slave lamps in the engine room or on the bridge wings. A number of function modules are available in a version with outputs for external lamps. Slave panels may be delivered as standard cassettes mounted with LED indication modules.

Maintenance — Troubleshooting and repair is possible simply by interchanging and exchanging the modules. Spare modules should be calibrated and tested by DEIF. In an emergency it will normally be possible to exchange electronic parts locally, however, a certain number of spare modules on board is recommended.

External auxiliary equipment

The alarm and monitoring system type MALLING 845 meets - in conjunction with a group alarm panel on the bridge and an extension alarm system in the engineers' accommodation - the requirements of the classification societies to periodically unattended machinery space (see user manual).

Power supply units

Power supply type 849.041 or type 468E3-041 (220V AC/24V DC, 10A) is supplied as a separate unit, applied to change to an alternative 24V DC voltage source on failure of primary voltage. Alarm contact for voltage failure.

Technical specifications

Supply voltage:	24V DC ±20% from transformer/rectifier or battery.					
Allowable ripple voltage:	±20% at 24V.					
Power consumption	15mA per module in normal condition (average for typical configuration). 40mA per module in alarm condition (average for typical configuration).					
Max. load of siren relay:	2A, 24V.					
Galvanic separation:	Between siren relay and circuits. Insulation at 500V DC > 1MΩ.					
Time delay:	Standard: 1 s. "..DL" versions: 1..25 s., continuously adjustable, symmetrical delay.					
Alarm inhibit:	Inhibit is activated by a make contact between the inhibit input of the relevant channel and 0V. Inhibit inputs for channels in the same inhibit group are connected together.					
Analog outputs:	0..1V, max. 2mA for external instruments (if any)					
Load of sensor contact:	**Binary function modules** 1.5mA (closed contact), 20V (open contact).					
Max. load per group output:	**Group alarm modules** 500mA. Internal current limiter.					
Sensitivity:	**Earth fault module** Leakage resistance R < 25kΩ will release an alarm. Back to normal at R > 50kΩ.					
Standard temperature ranges:	**Instrument module** 100°C, 600°C.					
Standard pressure ranges: (Bar or Kp/cm²).	0...1.000	0...1.600	0...2.50	0...4.00	0...6.00	0...10.00
	0...16.00	0...25.0	0...40.0	0...60.0	0...100.0	0...160.0

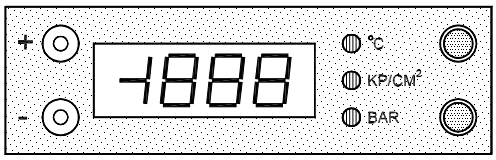
General technical specifications	
Temperature:	-10...55°C (nominal), -25...70°C (operating), -40...70°C (storage)
Climate:	Class HSE, to DIN 40040
Vibration, shock and humidity:	According to the requirements of the classification societies.
EMC:	To EN 50081-1/2 and EN 50082-1/2
Materials:	Front plates: black noryl. Fire retarding and self-extinguishing to UL94 (V0). All metal parts made out of corrosion preventing material.
Connections:	Screw terminals on the rear of the cassette. Cable dimensions: 2.5 mm² (multi-stranded), 4 mm² (single-stranded).
Code pins:	35 pcs included on delivery per cassette.
Protection:	Front: IP31, to EN 60529 and IEC 529 Terminals: IP00, to EN 60529 and IEC 529

Alarm and monitoring system type MALLING 845 - components

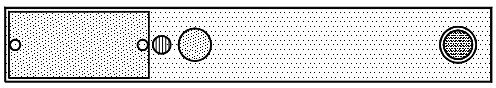
Type	Description	Weight (g)	Consumption (mA)	
			Normal	Alarm
845.71-CE 845.73-CE	Cassette for 21 modules. H x w x d = 483 x 132 x 210 mm Cassette for 12 modules. H x w x d = 303 x 132 x 210 mm	2750 1850		
845.41-03 845.41-06 845.41-30	Extension cable, 0.3m Extension cable, 0.6m Extension cable, 3.0m	37 70 320		
845.71-1 845.73-1	Fixed cable with terminals, for 845.71-CE, 2.5m or order specified Fixed cable with terminals, for 845.73-CE, 2.5m or order specified	4000 3000		
845.10B	Binary module (ON/OFF) with 2 alarms, N/C sensor	76	7.6	37.3
845.10BDL	Binary module (ON/OFF) with 2 alarms, N/C sensor, 1..25 s.	80	7.6	37.3
845.101	Binary module (ON/OFF) with 2 alarms, N/O sensor	88	9.5	42
845.101DL	Binary module (ON/OFF) with 2 alarms, N/O sensor, 1..25 s.	92	9.5	42
845.11B	Analog temperature module, Pt100Ω, -15..150°C	92	19	31
845.114	Analog temperature module, Pt100Ω, -15..200°C	90	18	32
845.15B	Analog module, 4..20mA	90	22-38	34-50
845.15BDL	Analog module, 4..20mA, 1..25 s.	92	22-38	34-50
845.20	Siren and test module	82	19	55
845.202	Group relay module, 1 group, with reset	70	3	35
845.25	Group alarm module, 2 groups	93	4.5	33[1]
845.31	Instrument module, digital, for pressure and temperature	226	47/95	
845.4	Blank module	33		
845.60	Cylinder temperature module, NiCr-Ni, 0..600°C Deviation from average value, direct connection	100	12	27
845.601	Cylinder temperature module, NiCr-Ni, 0..600°C Deviation from average value, through compensation box	100	12	27
845.61	High temperature module, NiCr-Ni, 0..600°C Direct connection	92	10	25
845.611	High temperature module, NiCr-Ni, 0..600°C Through compensation box	90	10	25
845.69B	Average value module	80	10	10
845.971	Earth fault module	76	5	17
845.L2	Indicating module with 2 slave lamps	56	0	30
845.S	Test and indicating module	61	15	30
	Resopal plate, white, ungraved (h x w: 18 x 38 mm). If engraved plates are required, please specify text.	0.6		
	Rivet, white plastic (2 pcs per plate included on delivery)			

1) Excluding external lamps

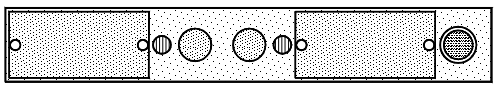
Front plates



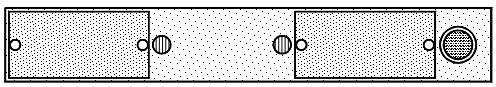
Instrument module



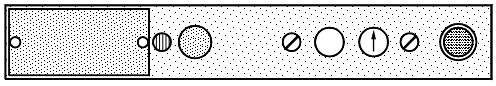
Group relay module



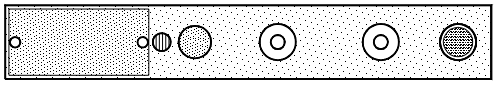
Binary module (ON/OFF)
Test and indicating module



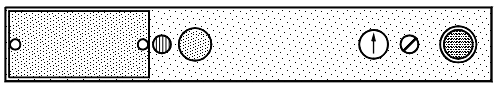
Group alarm module
Indicating module with 2 slave lamps



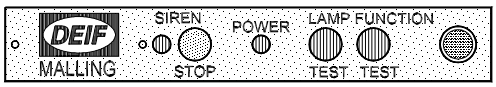
Analog modules, Pt100Ω and 4…20 mA
Cylinder temperature and average value modules



Earth fault module



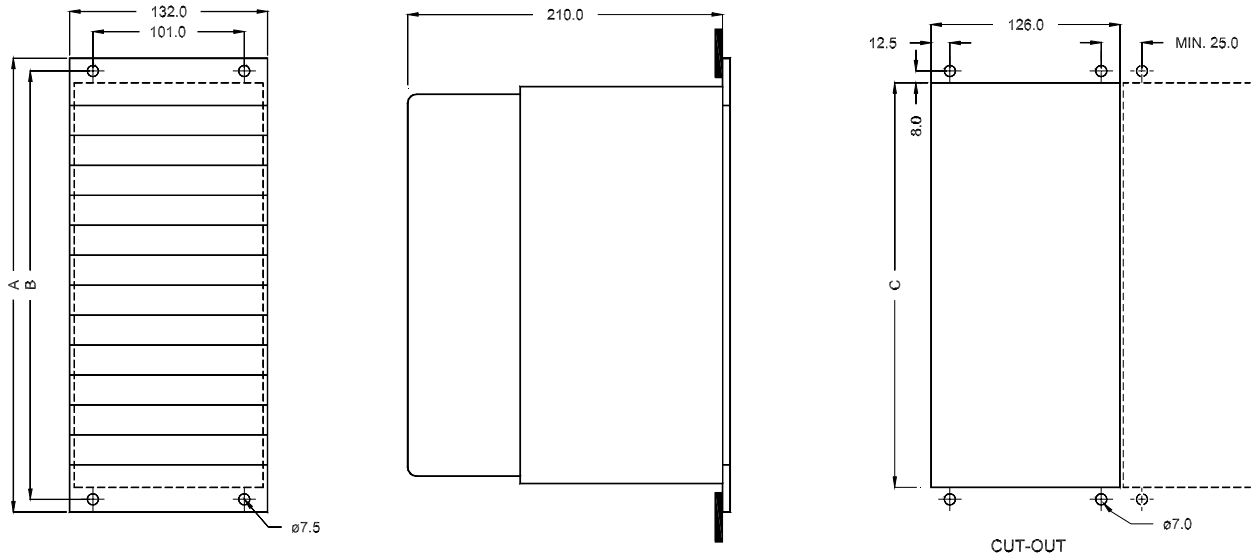
High temperature module



Siren and test module

Dimensions

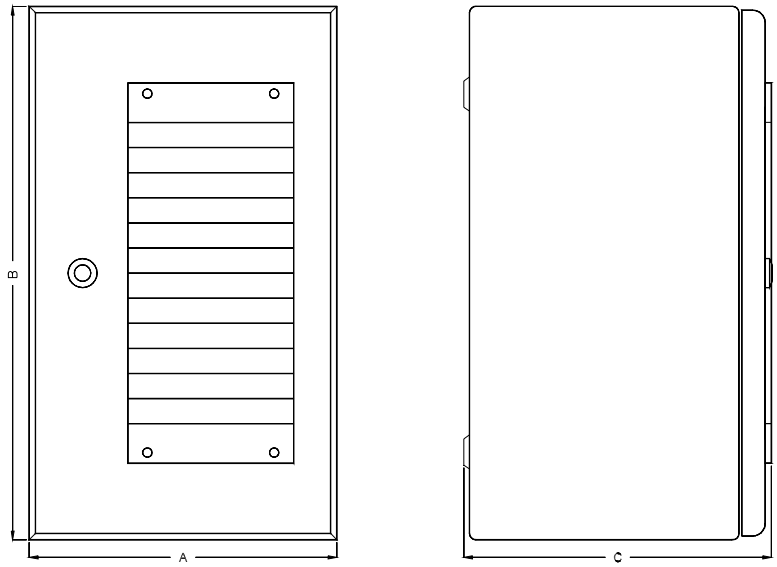
All dimensions in mm



Type MALLING 845 cassette (flush mounting)

Cassette	A	B	C	Average weight (approx.)	
“Small”, for 12 modules	303	286	270	2.9 kg	With typical selection of modules
“Big”, for 21 modules	483	466	450	4.7 kg	With typical selection of modules

All dimensions in mm



Type MALLING 845 in cabinet (bulkhead mounting)

Cabinet (example)	A	B	C	Average weight (approx.)	
”Small”, for 12 modules	425	245	242	6.8 kg	Cabinet without modules
”Big”, for 21 modules	540	305	242	9.9 kg	Cabinet without modules

Order specifications

Example 1: **As components**
Please state quantity and type number for all components plus text for engraved plates.

Example 2: **Ready-wired system for flush mounting**
List of alarms and measuring points (if possible using DEIF form). Wiring diagram if available. Length of fixed cable plus text for engraved plates.

Example 3: **System supplied in cabinet for bulkhead mounting**
List of alarms and measuring points or wiring diagram plus text for engraved plates.

Due to our continous development we reserve the right to supply equipment which may vary from the described.

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